



KODAK LINAGRAPH SHELLBURST Film 2474 (ESTAR Base)

KODAK LINAGRAPH SHELLBURST Film 7474 (Gray Base)

KODAK LINAGRAPH SHELLBURST Film 5474 (Gray Base)

PHOTOGRAPHIC AND PHYSICAL PROPERTIES

KODAK LINAGRAPH SHELLBURST Films 2474 (ESTAR Base), 7474 (Gray Base), and 5474 (Gray Base) are designed especially for cinetheodolite photography—motion-picture photography of aerial objects from the ground. These films produce maximum contrast in pictures of distant aircraft, mis-

siles, and other targets against sky backgrounds having various degrees of atmospheric haze and low-contrast conditions. These films can also be used in spark-chamber photography, bubble-chamber photography, and other applications where high resolution is of prime importance.

Features

- Panchromatic emulsion with extended red sensitivity
- Medium speed
- Medium granularity
- High resolving power
- Moderately hard emulsion for processing up to 32°C (90°F)
- KODAK LINAGRAPH SHELLBURST Film 2474 is on ESTAR Base, a clear, tough, dimensionally stable polyester support 0.004 inch thick. This film has a dyed-gel backing for halation protection which may not be compatible with certain high-speed processors.
- KODAK LINAGRAPH SHELLBURST Films 7474 and 5474 are on gray triacetate base, 0.0052 inch thick, which affords protection against halation and light-piping. These films have a fast-drying, lubricant backing suitable for processing in high-speed processors. This backing also provides improved static protection.

Uses

Cinetheodolite photography
Spark-chamber photography
Bubble-chamber photography

Darkroom Handling

Total darkness is required. After development is 50 percent complete, however, you can use a KODAK Safelight Filter No. 3 (dark green) in a suitable safelight lamp with a 15-watt bulb for a few seconds if it is kept at least 1.2 metres (4 feet) from the film.

Color Sensitivity

Panchromatic with extended red sensitivity

Storage

Unexposed Film: For best storage, keep the unopened box in a cool place, 21°C (70°F) or below. To avoid moisture condensation on film that has been refrigerated, allow 16 mm film to stand at room temperature for at least 1 to 1½ hours before removal from the package; for 35 mm film, allow 2 to 3 hours.

Exposed Film: Process as soon as possible after exposure.

Processed Film: For best storage, keep processed film at a temperature of less than 21°C (70°F) and at a relative humidity of 30 to 50 percent.

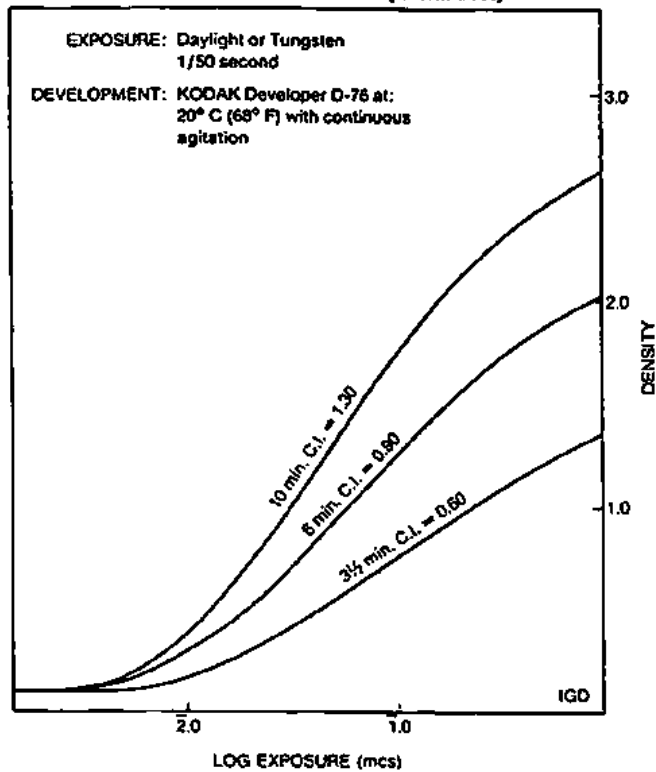
Exposure Information

The exposure data given below have been derived using the primary development recommendation for a particular developer with this film. The primary development recommendation for each developer is shown in green in the development table found in the section entitled "Conventional Processing."

Photorecording Sensitivity: 200 This figure is based on the reciprocal of the tungsten exposure in metre-candle-seconds required to produce a density of 0.10 above gross fog at an exposure time of 1/10,000 second and the primary development recommendation for KODAK Developer D-19.

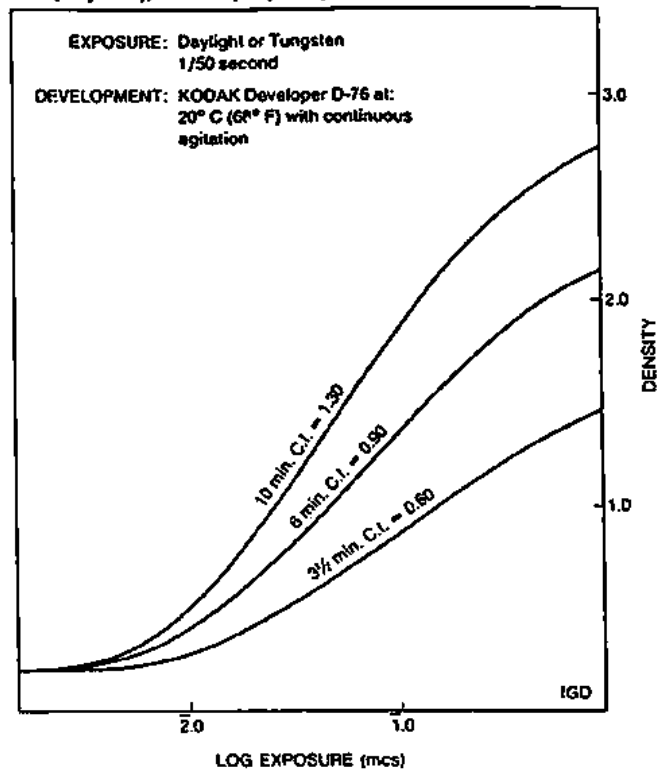
Characteristic Curves

KODAK LINAGRAPH SHELLBURST Film 2474 (ESTAR Base)



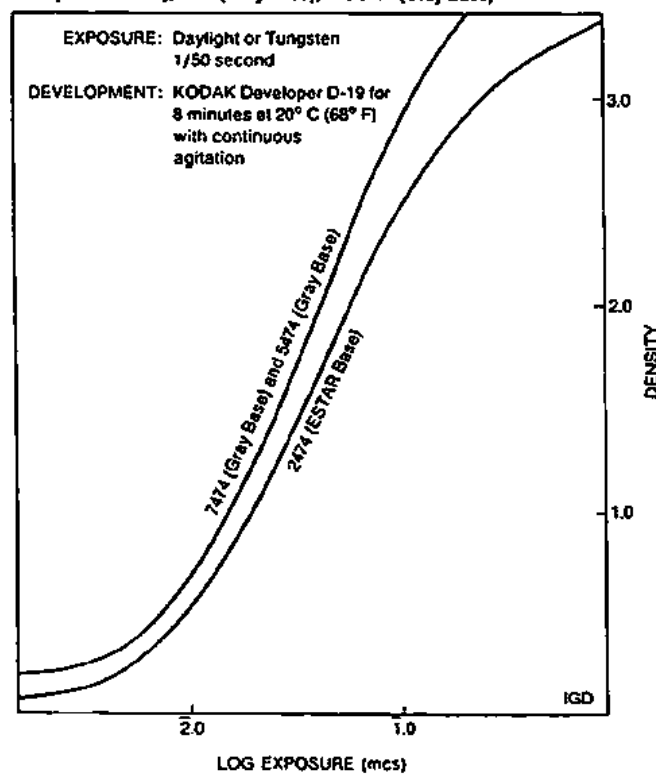
Characteristic Curves

KODAK LINAGRAPH SHELLBURST Films
7474 (Gray Base), and 5474 (Gray Base)



Characteristic Curves

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2474 (ESTAR Base), 7474 (Gray Base), and 5474 (Gray Base)



CRT Exposure Index: The figures given below are based on the reciprocal of the exposure in ergs/cm² required to produce the densities listed, with the given simulated phosphor, and with the primary development recommendation for KODAK Developer D-19, with continuous agitation.

Simulated Phosphor	KODAK LINAGRAPH SHELLBURST Films	CRT Exposure Index at Net Density of		
		0.10	1.0	2.0
P11	2474	64	10	3
	7474/5474	64	10	4
P16	2474	125	16	5
	7474/5474	125	16	6
P24	2474	40	8	2.5
	7474/5474	40	8	3

Exposure Index: 250 As a starting point, use this exposure index with meters marked in ASA speeds or exposure indexes, for subjects with normal contrast. The primary development recommendation with KODAK Developer D-76 yields a contrast index of 0.9 (gamma of about 1.0). The value above is based on an exposure time of 1/50 second, daylight or tungsten, with the formula $EI = 16/E$, where E is the exposure in metre-candle-seconds required for a density of 0.90 above minimum density (the ANSI upper density point for contrast), with the indicated development. Prints made from the negatives usually require a photographic paper about one contrast grade lower than normal. If exposure or development conditions other than these are used, determine the exposure index value by trial. In these cases, the following adjustments are offered as a guide.

New Condition	Adjustment
The same contrast index with increased Developer D-76 temperature	Increase exposure index up to 60 percent
Reduced subject contrast	Increase exposure index and develop to a higher contrast index in Developer D-76 or Developer D-19.
Best printing quality with normal subject contrast and normal paper contrast	Decrease exposure index up to 75 percent and reduce development in Developer D-76 to achieve a contrast index of 0.6.
Exposure filters required for special effects	With an unfiltered meter, reduce the exposure index up to 90 percent, as required.

Reciprocity Data: The following chart describes the speed, exposure, and contrast changes over the range of exposure times indicated, with primary development time in KODAK Developer D-19.

	Exposure Time in Seconds								
	10 ²	10 ¹	10 ⁰	10 ⁻¹	10 ⁻²	10 ⁻³	10 ⁻⁴	10 ⁻⁵	10 ⁻⁶
Speed*	-90%	-75%	-50%	-15%	None				
Exposure†	+3	+2	+1	+½	None				
Contrast‡	-15%	-10%	None						

*Speed change at a net density of 1.00.

†Required exposure adjustment in photographic stops.

‡Change in average contrast between net densities of 0.30 and 1.00.

Image-Structure Characteristics

This information is based on the primary development recommendation with KODAK Developer D-19.

Resolving Power

Test-Object Contrast	Test-Object Contrast
1.6:1	1000:1
50 lines/mm	125 lines/mm

The above values were determined according to a method similar to the one described in ANSI Standard PH2.33-1969, "Method for Determining Resolving Power of Photographic Materials."

Diffuse RMS Granularity 24

This value represents 1,000 times the standard deviation of density produced by the granular structure of the material when a uniformly exposed and developed sample is scanned with a densitometer calibrated to read American Standard diffuse visual density, and having a circular measuring aperture 48 micrometres in diameter. Granularity is an objective measurement of the spatial variation of sample density that generally correlates with graininess, which is the subjective effect of image nonuniformity upon the observer. Broadly speaking, granularity measurements with the 48-micrometre aperture will indicate the magnitude of the graininess sensation produced by viewing the diffusely illuminated sample with 12× monocular magnification. It should be noted that if the viewing conditions are changed from the specified 12× condition, the published rms values no longer correctly indicate the relative sensations of graininess produced by various samples.

PROCESSING

Conventional Processing

The maximum processing temperature for KODAK LINAGRAPH SHELLBURST Films 2474 (ESTAR Base), 7474 (Gray Base), and 5474 (Gray Base) is 32°C (90°F). Consider the development times listed below as starting points and modify them as required for individual equipment, techniques, and requirements. To minimize process nonuniformity at elevated temperatures, use a conventional processing machine rather than rack or tank processing. Processing-solution temperatures should be kept within 3°C (5°F) of the developer temperature.

DEVELOP the film with continuous agitation for the following times. The times shown in green are primary development recommendations for these films.

Development Time (in minutes)

KODAK Developer	20°C (68°F)	24°C (75°F)	29.5°C (85°F)	32°C (90°F)	35°C (95°F)	40.5°C (105°F)
D-19*	8	5	2¼	1½	NR	NR
D-76†	6	4½	3	2½	NR	NR

NR—Not Recommended

*Development times at each temperature are to maintain a constant speed at 0.30 above minimum density.

†Development times at each temperature are to maintain a constant contrast index of 0.9 (gamma of about 1.0). Increase exposure index up to 60 percent at higher temperatures.

RINSE the film in KODAK Stop Bath SB-1a or KODAK Indicator Stop Bath for 10 to 20 seconds at 18.5 to 32°C (65 to 90°F).

FIX the film with frequent agitation as follows:

Fixer	Fixing Time at 18.5 to 32°C (65 to 90°F)
KODAK Fixing Bath F-5 KODAK Fixer KODAK LINAGRAPH Fixer	3 to 5 minutes
KODAK Rapid Fixer	1½ to 2½ minutes

NOTE: For rapid access to data, fix only for the time required for the negative to clear. If the negative is to be preserved, then you must return it to the fixing bath for the times recommended above; then wash and dry it.

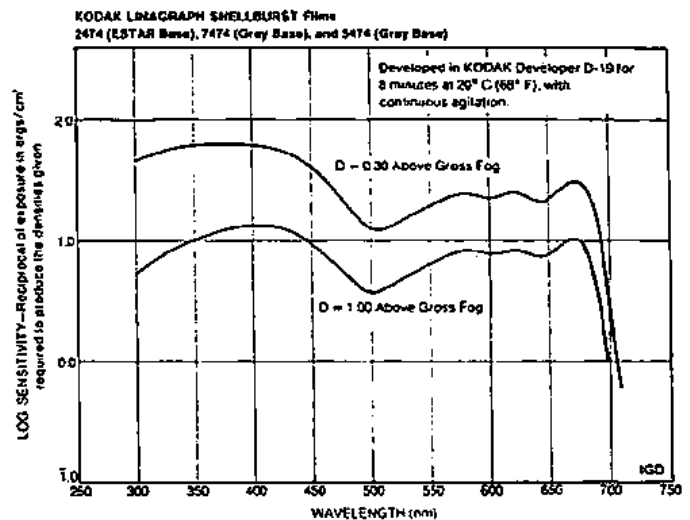
WASH the film in clear running water for 5 to 10 minutes at 18.5 to 32°C (65 to 90°F).

Rapid Wash: To reduce washing time and conserve water, rinse the film in running water for 20 seconds, immerse it in KODAK Hypo Clearing Agent for 1 minute, followed by a 1-minute final wash, with at least one change of running water at the temperature of the other processing solutions.

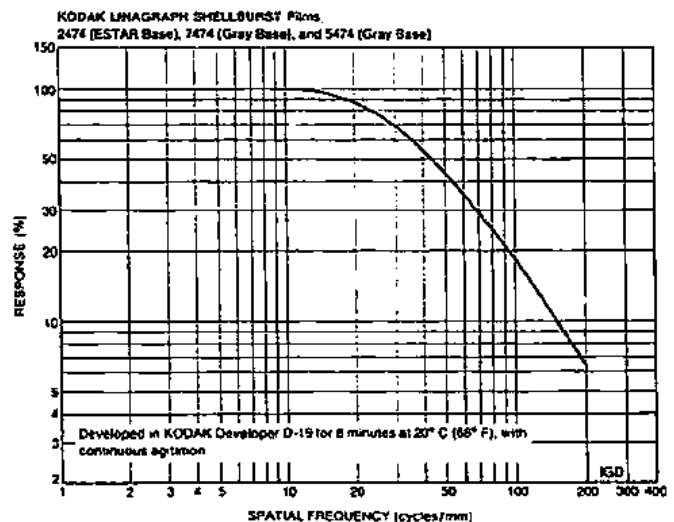
DRY in a dust-free area.

The sensitometric curves and data in this publication represent product tested under the conditions of exposure and processing specified. They are representative of production coatings and, therefore, do not apply directly to a particular box or roll of photographic material. They do not represent standards or specifications which must be met by Eastman Kodak Company. The Company reserves the right to change and improve product characteristics at any time.

Spectral Sensitivity Curves



Modulation Transfer Curve



Example: 5 rolls, 16 mm x 125 ft, KODAK LINAGRAPH SHELLBURST Film 2474 (ESTAR Base), Ident. SCE430, CAT. No. 184 5924.

KODAK LINAGRAPH SHELLBURST Film 2474 (ESTAR Base)

Size mm x ft	Identification Number	CAT. No.
35 x 250	SCE744	167 4761
35 x 250	SCE746	171 7081
35 x 500	SCE718	161 4528
35 x 500	SCE746	167 4845
70 x 150	SCE474	183 7145
3½ x 100 ft (for cameras designated 90 mm)	SCE825	152 1046

KODAK LINAGRAPH SHELLBURST Film 7474 (Gray Base)

Size mm x ft	Identification Number	CAT. No.
16 x 100	SG449	153 4783

KODAK LINAGRAPH SHELLBURST Film 5474 (Gray Base)

Size mm x ft	Identification Number	CAT. No.
35 x 200	SG744	167 5040
35 x 200	SG746	155 0466
35 x 400	SG746	155 0482

Description of Identification Numbers

- 449: 16 mm subdued-light load,* perforated two edges, on Kodak spool (R-90), integral leader and trailer.
- 474: 70 mm, subdued-light load,* unperforated, on Kodak spool (S-84), integral leader and trailer.
- 718: 35 mm, on Type U core, footage-numbered. Darkroom load, BH perforations.
- 744: 35 mm, subdued-light load,* BH perforations with .1866 short pitch, on Kodak spool (S-101), no leader or trailer.
- 746: 35 mm, darkroom load, on Type U core. Otherwise the same as 744.
- 825: 3½-inch, darkroom load, on Type E core, latent-image frame numbered, no leader or trailer.
- *KODAK LINAGRAPH SHELLBURST Films require loading and unloading under a KODAK Safelight Filter No. 3 (dark green).

The Kodak materials described in this publication are available from those dealers normally supplying Kodak materials for instrumentation. Equivalent materials can be used if desired.

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